The Saturn Probe Interior and aTmosphere Explorer (SPRITE) Mission Concept

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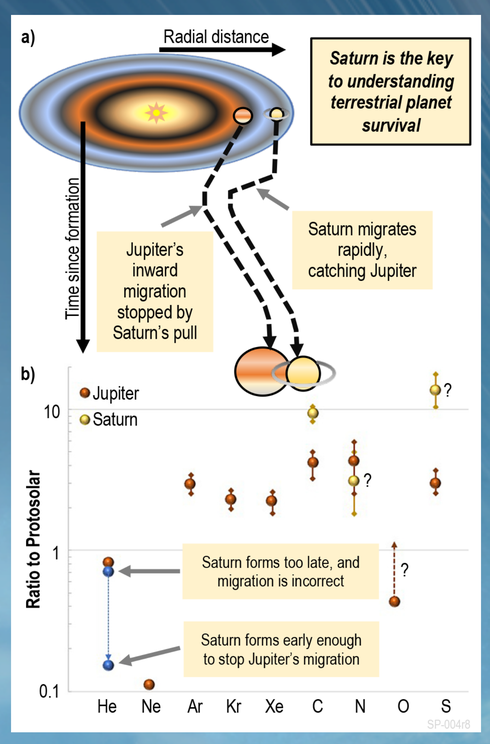
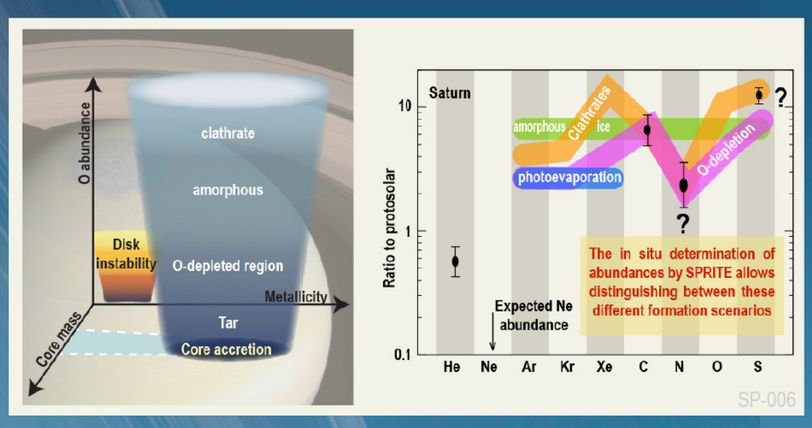
SPRITE is a Saturn Probe mission concept that was proposed in response to NASA's New Frontiers 4 call in 2017. Although not selected, atmospheric probe science remains the benchmark for understanding many fundamental questions about the formation of solar systems and how gas giant planets work. This is important because gas giants are common throughout the galaxy and largely control the architecture of their host planetary systems.

Why do we need an atmospheric probe?

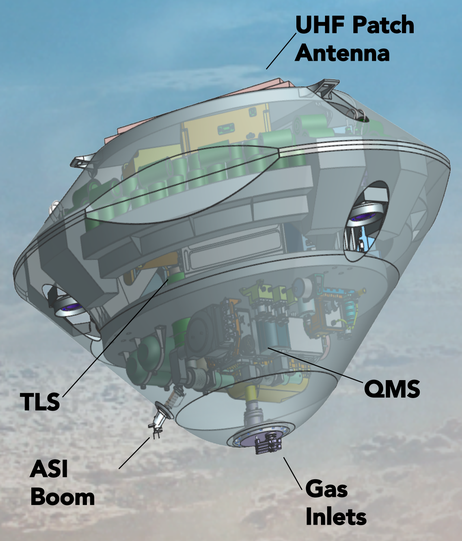
Although Cassini orbited Saturn and returned spectacular data for 13 years, Cassini was limited to what could be sensed above the dense cloud tops. A probe mission can measure elusive noble gas and isotopic abundances, as well as the altitude profile of elemental composition. A probe can also directly measure the dynamics below the clouds, tying the cloud top motions to the global atmospheric circulation. Since Saturn's cloud structure is far less variable than Jupiter's, the probe entry location is not a strong mission design driver.

SPRITE would provide evidence of Saturn's formation, possible migration, and early evolution





The abundance of Helium is critical to constraining Saturn's age. The full pattern of compositional fingerprints reveal how the protoplanetary nebula evolved.



Proposed Instrument Complement

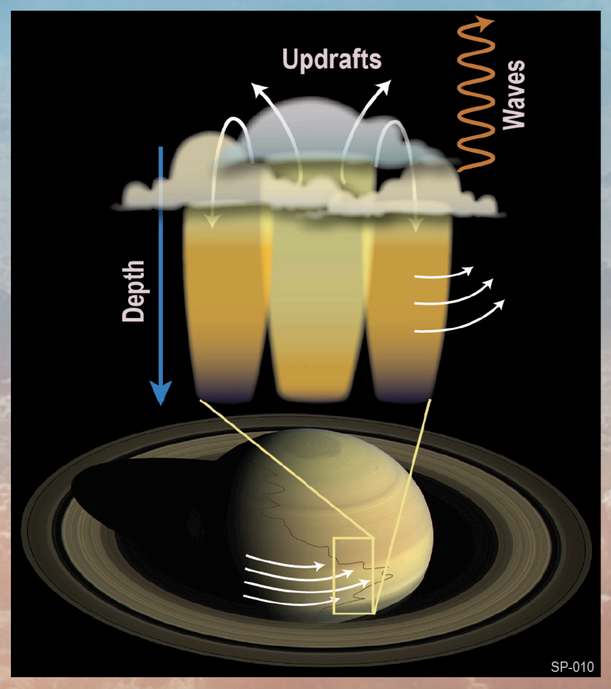
QMS: Quadrupole Mass Spectrometer

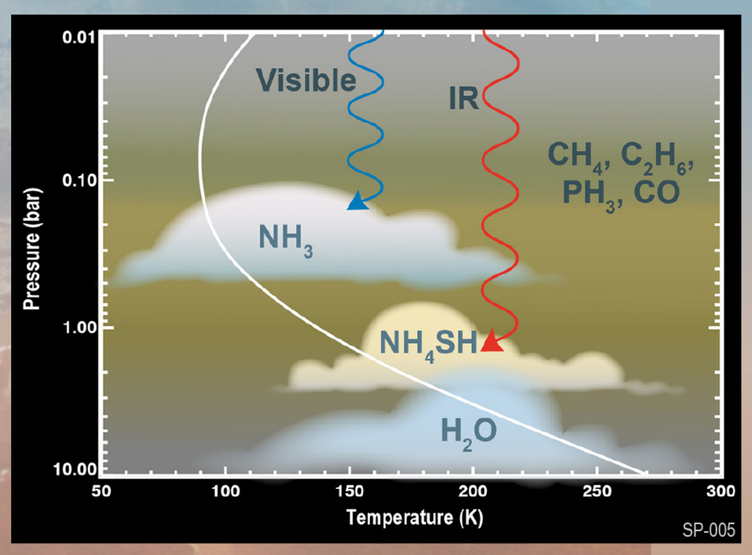
TLS: Tunable Laser Spectrometer

ASI: Atmospheric Structure Instrument including Doppler Wind Experiment

MCI: Multi-Channel Imager – on relay spacecraft

SPRITE would reveal properties and processes hidden beneath Saturn's cloud tops





Direct probe measurements of cloud structure and atmospheric dynamics tie the remotely-observed cloud top motions to global circulation and cloud chemistry.

Background image: Joe Bergeron 2007